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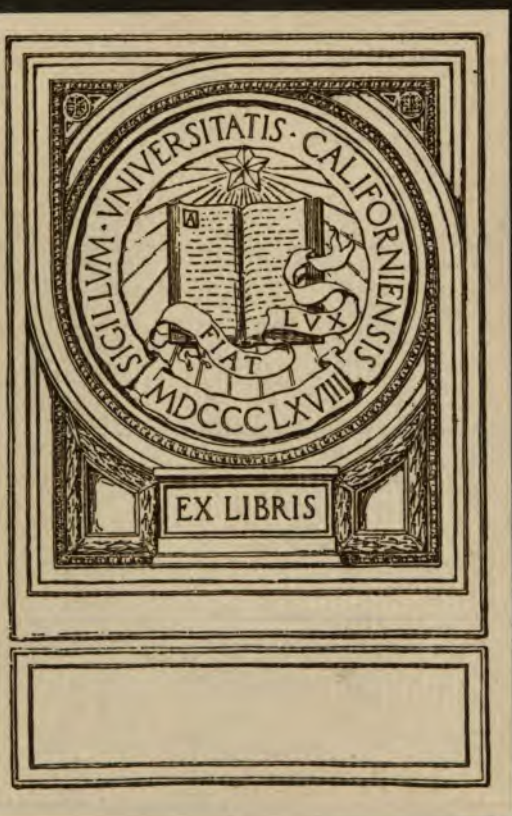
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THE FIXED IDEA .

OF

ASTRONOMICAL THEORY.

We may in thought pursue a train of hypotheses and suppositions, but they do not thereby acquire reality; still, in a normal condition of the human intellect, it is impossible to conceive that any thing can exist and not exist at the same time.

BY

AUGUST TISCHNER.

~~1634~~

LEIPZIG
GUSTAV FOCK
1885.

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TO THE
AIRBORNE

Schubert

Claudius Ptolemaeus.

UNIV. OF
CALIFORNIA*Terrae stator, solis motor.*

TO THE
LIBRARY OF THE
UNIVERSITY OF TORONTO

Nicolaus Copernicus.



Terrae motor, solis stator.

TO THE
LIBRARY

Wiliam Herschel.



Terrae, solisque motor.

TO VINU
AMBOHIAO

DEDICATED
TO ALL CANDID FRIENDS OF RATIONAL
ASTRONOMY.

736353

Dear Sir!

I don't doubt that you look in science for nothing but truth, and admit, that theory is but an attempt to explain inexplorable, great Nature, and that theory can serve but for a resting-point, a point of departure for further explorations, and that science, if raised to dogma, is brought to a standstill, and any further success is rendered impossible.

The history of science proves, too, that at every time there have been stated theories which in the course of time must be variously altered and even replaced by others quite opposed to them.

It was as an explanation of the phenomena of heaven, that the theory of a fixed earth in the centre of the universe was stated; this theory was found to be untenable, when the movement of the earth was recognized, and now theory based itself on a fixed sun. But afterwards it was discovered, that even the sun is not fixed, but transposes himself in space. The conviction, too, was arrived at, that not only the sun moves in mundane space, but also, that the stars, too, are not fixed, but in motion. In short, in the universe there is no immovable

thing, neither a fixed earth, nor a fixed sun, nor fixed stars. Now, instead of stating or seeking some theory based upon the general movement of all the heavenly bodies, mankind has become so enamoured of the idea of a fixed sun, that no astronomer has the courage to come forward in order to demonstrate that the present conception of the universe is no longer tenable. They have even dared to affirm, that it is quite irrelevant to theory, whether the sun is considered as fixed or as in motion; for astronomers say, "we may consider the sun as being at rest."

Dear Sir, I don't doubt, that you are endeavouring to lead science to truth, and I hope, you will cause the question thus raised to be seriously discussed.

I am, Sir,

your obedient servant

Leipzig.

August Fischner...

To Mr. Scheberle
assistant of the Detroit Observatory.

To the Reader.

To remove misunderstanding, we must remark, that in our pamphlets we do not attack practical astronomy, which, with the excellent instruments at its command, has attained a high perfection. We do but reject the present astronomical view of the world along with the Copernican hypothesis. According to the hypothesis of Copernicus, the sun is fixed in the centre of the universe; observations prove, however, that he is not fixed, but moves. Now, if we know, that the sun moves, why are we always to treat him "as at rest?" On this account astronomers are bound to give a rational explanation.

The fixed idea of astronomical theory.

We may in thought pursue a train of hypotheses and suppositions, but they do not thereby acquire reality; still, in a normal condition of the human intellect, it is impossible to conceive that any thing can exist and not exist at the same time.

Copernicus established his system on the hypothesis of a fixed sun. Those who worked at the construction of astronomical theory, were fully convinced that his system was wholly right and derived from nature itself.

The system of Copernicus was not immediately adopted by the learned men of his time, its very possibility was contested by the most celebrated astronomers, and it is, even now, admitted by not a few only as the best hypothesis. But astronomers and mathematicians contend, with an obstinacy one might call fanatical, that we may consider the sun as "at rest." Astronomers, however, refer motion only to fixed points (centres), and are obliged to measure from these, but as such fixed points nowhere exist in the universe, we cannot wonder, that they could not attain to the comprehension of a universal motion.

It was by the heroic appearance of Galilei that the system of Copernicus attained to general propagation, and was, by the majority of modern astronomers and mathematicians, by means of analysis, declared to be the only possible and right system, and it is by them, too, asserted that only foolishness and ignorance cannot comprehend it.

Galilei is said to have exclaimed: "And yet it (the earth) moves." But because the earth is in motion, it does not necessarily follow that the sun is at rest. If Galilei had said "they both move", that is, the sun as well as the earth, Laplace would have been spared the pains of arguing "analytically" that the sun must be fixed. What "analysis" is that, which argues that the sun is fixed, while observations prove that he moves!

All astronomers know very well that the sun changes his position in space, and others who copy their words in their books, know very well that the sun is in motion. How then, are we to explain this frivolous trick of so lightly overlooking the fact of the sun's motion?

Herschel was the first to make determination about the direction and course of the sun. Now-a-day nobody doubts the truth of this fact; it being the general opinion that not only the sun moves itself, but that nothing at all in the universe is at rest. Yet they teach by writing and speaking and in school, that the sun moves in the space, and is at the same time motionless, or may be considered at rest. There exists thus for astronomers a "motion at rest."

If the sun is not fixed, the system of Copernicus is fallen, if the system is a truth, astronomers must prove that the sun does not move. Motion round the centre as well as the closed circles or ellipses, in which the planets are said to move, are conceivable only with a fixed sun. Now, to obtain their closed ellipses and the planes to them, astronomers must absolutely determine that the sun does not move. Either the sun moves, or it does not; a moving sun, which is at rest, is an impossibility, a nonentity. If the sun moves, there is no fixed centre, there are no closed or recurrent curves and no planes of orbits; if

these must to be obtained at any cost, the sun must be made to be absolutely at rest, but he cannot be made to be at one and the same time in motion and not in motion.

Circulation round the fixed centre or in closed curves is, after the establishment of the theory of attraction by attracting centre, proved to be impossible, for if an attracting centre is moving, the bodies attracted by it cannot move round it in closed curves.

The sun, eternally moving in the universe, carries with him his system, the planets etc.; none of the appertaining bodies can remain behind, all must follow the sun with the same velocity, without regard to their circulation, without regard to their own movement. While the planets are following the sun, they make curves of revolution. The sun advancing, no planet can precede or move in front of him in his path or orbit. If the sun is moving, there are no closed orbits reëntering into themselves, nor planes of orbits.

The moving sun changes the orbits (curves of revolution) of the planets following him into spirals; the ring of the spiral is therefore the true curve of revolution of the celestial body, which it describes by its own velocity; the curve centrally seen is a circle, the consecutive rings will therefore exhibit a series of revolutions as a cylindrical spiral. If the diameter of the ring is known, there results thence the proper velocity of the celestial body. The longitudinal extension of the spiral depends on the space the sun passes through during the time of revolution of the planet; this space indicates the leading or conducting velocity of the planet. The total or absolute velocity of the planet consists therefore of its own velocity and that of the sun; if the latter is known, the elongation of the curve of revolution is likewise known.

It is evident that the leading velocity of all planets is the same, independent of their distance from the sun.

acquires But the spiral, in itself a line of double curvature, by the course of the sun its third curvature, for a motion in a straight line being impossible in space, the sun makes a curve himself. If we imagine the moon, as she follows the earth, we see that her orbit is composed of at least four different curvatures; if we consider the rotation of the earth, as it influences the phenomena of the motion of the moon, and the geographical situation of the observer, who sees the phenomena changed according his very position: we have formed an idea of the complications of the motion and situation of the moon in space, and we comprehend that, in consequence of these uninterrupted variations in motion and position, the various phenomena shown by her must change at every moment. If, therefore, the mode of this motion comes to our knowledge, the inequalities, anomalies, perturbations etc. will explain themselves.

The notion of the connexion and coherence of the system is only to ^{be} explained by the moving sun: that, what follows him and does not remain behind, belongs to him. The sun draws his system with and after him; if, therefore, the whole system moves, each body belonging to it must undoubtedly move with it in the same manner; it is for the same reason evident, too, that the direction of the sun is the direction of the system and all its parts.

Whatever is incomprehensible on the hypothesis of a sun at rest or fixed, becomes perspicuous and intelligible, if the sun is in motion.

While they worked on, confirming and as they supposed perfecting the system of Copernicus, they must surely have felt, that moving sun was capable of overthrowing

their theoretical conceptions; nevertheless they continued to work until our time.

While Laplace continued his work with exemplary perseverance, the sun protested loudly enough against his immobility; he clearly demonstrated that he will not be a fixed point for the fixed planes; but it was in-vain: the great mathematicians despised his remonstrances, and so he had to act fixed, nolens volens, according to their high will.

Laplace says also in his "Considerations on the system of the world" pp. 396, 397: The moon makes a nearly circular orbit round the earth, but, seen from the sun, she seems to form a series of epicycloides, the centres of which are on the circuit of the earth's orbit. The earth likewise makes a series of epicycloides, the centres of which are on the curve which the sun describes round the centre (point of gravity) of the group of stars to which he belongs. Finally the sun himself makes a series of epicycles, the centres of which are on the curve, which the point of gravity of that group of stars describes round that of the "universe". Astronomy has already taken a great step by making us acquainted with the motion of the earth and those epicycloides, which the moon and the satellites describe on the orbits of their respective planets. But if it wanted centuries for the understanding of the motion of the planetary system, what immense space of time is required to determine the motion of the sun and stars! Already observations are showing us these motions: they seem, upon the whole, to indicate a general movement of all bodies belonging to the solar system towards the constellation of Hercules; but they seem to demonstrate, too, that the apparent motion of the stars is a combination of their own movement with that of the sun. Laplace says also, "that the proper velo-

city of the sun is at least equal to that of the earth in its orbit."

And yet it is the very same Laplace, who says repeatedly in his work, that the sun in truth is motionless, and supports all his conclusions and demonstrations by this immobility.

It is the same Laplace, who sets forth here the epicycloides rolling on in infinity without end, but in his work strictly demonstrates the elliptical movement of all celestial bodies — except comets — by means of analysis which requires invariable planes.

For Laplace, therefore, the motion of the sun is something accidental, a secondary thing, a curiosity, which has nothing in common with theory, and which is without influence, of no consequence to him and his work.

The fact is that the planets do not revolve round the sun, but follow him. It is evident that the revolution is related to the sun and his centre; but in truth they proceed round the orbit of the sun. The moon for example moves with the earth in the same direction. The velocity of the earth surpasses the proper velocity of its satellite, even according to theory, more than thirtyfold: their distance remains the same. But now, how can any one say, as Laplace says himself, that the moon revolves round the earth in a closed nearly circular curve? It is possible that this circle round the earth is in agreement with the laws of highest mechanics, but it is surely in contradiction to Nature. But how do astronomers render possible what is impossible? By considering the earth, with reference to the moon, as "at rest"; for they think, that, if they consider the earth as "at rest", it will not move. If the planets follow the sun, and the satellites

follow the planets, how are we to get a revolution around the centre?

While the planets describe their original curve, they are drawn forward by the sun; the consequence of which is the inevitable necessity for the spiral as the definitive curve of orbit or moving line of double curvature, which results from the combination of two velocities (forces), one of which belongs to the planets, being their originally received velocity which they themselves cannot change, the other belongs to the sun. It is this movement of the sun, which is communicated to the planets by attraction, their own velocity receives by it an increment which may be called leading or conducting velocity. The sum of both movements is the absolute velocity of the planet in space. What is understood of the sun and planets, may be said likewise of the planets and their satellites.

It is, therefore, the original circular motion of the planets, modified by the motion of the sun, which may be taken to be the path of their orbit, and the figure of which we have considered as a ring changed into an endless spiral. An isolated piece or part of the uninterruptedly continuing orbit, which may be signified by a periodically returning coincidence, we may call the curve of revolution of the planet. This curve projected on the celestial sphere, on the apparent hollow sphere of the sky and seen centrally, appears, at first sight, as closed; a continued, more accurate consideration shows, however, that even the projection is not a closed figure, but is self-continuous. A proof of this is given by the phenomenon of precession.

Essay.

Quaerendo, non affirmando.

The first consequence of the movement of the sun delivers astronomical theory from a great burden: it no longer needs centrifugal force. Vide appendix VI. — —

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If attraction — thanks to the sun — has delivered itself from its mortal enemy, the centrifugal force, it, too, can act unhindered and will produce the invariable distance of the planets from the sun.

We may now sketch, as an approximation, the following image of the solar system.

After the sun, who is like the nucleus of a comet preceding it, there come, ranged one after another, the planets, the curves of revolution of which enlarge more and more according to their distance, as if they represented so many centrifugal pendula, the threads of which proceed from the centre of the sun.

If all these are in revolution and the sun is, for a moment, considered as immovable, the threads (radii vectores) form regular cones, the base of which is perpendicular to their axes. The circumference of this base of the cone is,

what we have called the original curve of revolution. If these cones are situated in the same angle, they seem to make but a single one, the planets revolving on the surface of it.

To judge from observations, it seems indeed, that the cones are situated nearly in the same angle, and that in consequence of this situation, the zodiac is to be considered as a common boundary of the orbits.

The central projection of the rings is, of course, a circle, which, when projected, changes into one or the other ellipse. Seen from the sun, the orbits of the planets appear as projected into a configuration, which is represented accurately by the diagram of Copernicus: the sun being in the midst of all the orbits, the planets seem to revolve round his centre.

The cone itself is shown by the profile; now, if the curves are situated in the same angle, the sizes of the orbits — their semi-diameter — are as the distances of the planets from the sun. It is self-evident that from no planet can this cone of an other planet be seen as central; the curves must therefore present themselves as eccentric circles or ellipses. The earth, in regard to other planets, among the most various positions gets also into one, in which the satellites of the planets show centrally projected orbits.

Now, if the sun moves, the direction of his movement is the common axis of the cone, that is to say, the planets revolve round the line described by the sun, which we may call his orbit; this line is the very equator of heaven.

By the movement of the sun, the orbits of the planets, hitherto considered as plane curves or rings, change into spirals, which are the more extended, as the velocity of

the sun is greater, compared with the proper velocity of the planet; these curves of double curvature are no longer perpendicular to the axe of the cone or to the orbit of the sun, but they have such an inclination to it, as is indicated by the angle of the cone.

If we suppose that the sun moves in a straight line, the rings of the spirals described by the planets form a cylinder, the diameter of which is equal to the diameter of the original curve of revolution or spiral ring; in that case one might call the spiral cylindrical, the consecutive rings of the same diameter having likewise the same situation; but it is clear in itself, that the sun moves in a curve, too, therefore the cylinder we have imagined plane, will acquire a curvature, which to the curvature of the spiral — double by itself — adds a third one. It is a matter of course that the diameter of the spiral rings is not altered by this third curvature, but the projection of them is modified. According to this view, the cone, the figure of the system, will acquire a slight curvature and give an image, which reminds us the figure of the horn of plenty. The central section — in the length of the axe — of this curved cone is a spherical triangle. Now, seen centrally, the sun will no longer be in the centre of all the orbits (spiral rings), but there are produced the eccentricities as well as the apparent inclinations of the orbits towards another.

The earth is little distant from the top of the cone — the sun — and moves on its surface; it sees the ever changing position of the planets in perspective; at every moment of the motion there appears another projection.

If we suppose, that all planets are in the same line of the surface of the cone, that is just as if we were to say according to the system of Copernicus, that the interior

planets are in conjunction at the same time as the exterior ones are in opposition. This position of all planets was taken into consideration already by the ancients, ^{and} its recurrence called the Great Period. That this Great Period has been very much enlarged by the two newly discovered planets Uranus and Neptunus, is clearly apparent.

Each planet has its originally received velocity, and its period of revolution seems, if not to depend directly upon, to be in proportion to its aphelion. All periods of revolution renew themselves regularly as well as the relative positions of the planets with respect to each other. It is therefore comprehensible that the planets during their revolution assume those various positions, which they have marked with the names of conjunction, opposition, quadrature etc., but which need a correction, even if the apparent angular distance, in reference to the sun, is preserved, as is required by observation.

As to the periods and positions of the bodies, which form the moving system, their change is inconsiderable, the whole remaining together, and consequently, the figure of the system being unchanged. The respective distances are chained to the regulated motion: if, therefore, observation of the bodies belonging to the system was sufficient for astronomy, the phenomena might be reduced to their greatest simplicity; as it is, ^{the} however, the starry heaven and its content, which serve as basis of comparison and projection, there follows hence a complication, according to which the heaven seems to transpose itself in the space.

If we consider the conical figure of the system, on the hypothesis that the sun is immoveable, the planets will describe closed curves, that is, they revolve in the same plane curve, which we have called the spiral ring or the original curve of revolution of the planet, and which,

of course, does not change its place in space, for which reason its plane, according to present notions, is to be considered as invariable. But that presumes another inadmissible condition, according to which the attraction of the sun exercises no other effect on the planets than that which is necessary to preserve the equilibrium of the system and the invariable distance of its bodies from the sun in such a manner, that none can approach to, and none remove from him. This condition remains unchanged with the moving system, and the effect of the attraction of the sun is reduced to the communication of his own velocity, in consequence of which the original curves of revolution change themselves into spirals. But now, it becomes intelligible from this effect of the attraction, that the planets must necessarily remain at the same distance from the sun. That the elongation of the spiral depends upon the relation of the two respective velocities (that of the sun and a planet, or of a planet and its moon), is a matter of course. This longitudinal extension of the curve of revolution is at the same time the inclination (whether declination or inclination, does not matter) of the spiral orbit towards the axe of the cone of the system (sun's orbit or equator); the angle of inclination is therefore obtained from the proper velocity of the planet and that of the sun. That the conducting or leading velocity, therefore, is the same for all bodies of the system, we have already mentioned.

It is evident, that, if there is observed in the heaven a perceptible transposition, which appears to be independent of the double movement of the earth, one may conclude with certainty, that this is the consequence of the sun's motion and the transposition of his system in space.

The foregoing diverse considerations will enable us to bring clearness into the question of revolutions or times of revolution. The continual transposition of the solar system in space requires the unintermitted transposition of the planets and their revolution; there is, therefore, an uninterrupted continuation of the same movement, and neither a true revolution, nor a time of revolution. A period of revolution is therefore the return of the same phenomenon, or the same apparent position; it is therefore relative, it is a coincidence. That these coincidences return periodically, results from the nature of general movement; that they return regularly, is — as it seems — the work of the universal attraction.

The question now is, which coincidence, the return of which phenomenon is to be considered as an accomplished revolution, a period of revolution or time of revolution, and to what does this period relate?

Theory has founded its choice or decision not on that rational view, which proceeds from the study of the phenomena, and has proved this by referring even the time of rotation of the earth to the stars, thus postulating a sidereal revolution, whereas it is evident enough, that we can only refer this movement of the earth to itself.

If the system of Copernicus was founded on reality, if the planets did indeed revolve round the sun, ever move in the same space, in closed curves, it is evident, that, after having passed 360 degrees, they would return to the same place in their orbit, and that, in this case, their position in reference to some comparative stars, after each revolution accomplished on this manner, would be the same. But as coincidence with the stars takes place in increasing periods, the consequence is that the movement of the planets cannot take place according to

the system of Copernicus, and that, therefore, their periods of revolution cannot refer to the ~~stars~~. If the system transposes itself in space, and remains everywhere the same without change, the coincidences, that is, the periods of revolution of the bodies forming the system can only refer to their guide, the sun, and we may conclude with certainty that the coincidences of the respective positions fall at the same periods, as the planets, keeping their aphelion, move with equal velocity.

It is a matter of course, that in consequence of the general movement as well as of the uninterrupted serpentine onward movement of the orbits, there arise different coincidences, that, thus, there appear periodically different phenomena; it was on account of this circumstance, that theory ascribed to the moon five different times of revolution. "Revolution" or "time of revolution" employed in this manner, has no longer any significance, any sense, as, according to the nature of the matter, we have to be contented with but one period of revolution.

If we call orbits the space passed through by the planets and satellites and the endless spirals described by them in this space, we embody in our thought the path of the celestial bodies which vanishes and leaves no track in order to facilitate figuratively our conception of their movement; if this running through one extended spiral ring is termed describing 360 degrees and an accomplished revolution, it is so termed with reference to the sun, and assumes, that the two extremities (beginning and end) of the spiral ring thus imagined are in the same line, that is, if the point of a spiral, for instance in the equinoxes of spring, coincides with the sun, its point of ending in this very same position — after an accomplished revolution — coincides likewise with the sun.

Having comprehended the importance of the solar movement, we may perceive, why so few phenomena of heaven are understood, and why so often we do not know what it is that we are observing. That is the spell which has lain upon science for four thousand years, and can be removed only by the sun.

This solar system, moving on without end and boundary, flying through infinite space; this cone, a point vanishing as respects its size in the universe, transposing itself in a line of double curvature, contains by the way all that, which man may distinctly perceive and successfully observe in the heaven; the phenomena apparently different, the motions and positions changing without end, the periodical and secular variations etc., all these exist, it is the unity of science, the basis of its theory. Comprehending the movement we do not need to take refuge in hidden powers; each explication becomes superfluous, even useless; nature explains itself, assuming that man is capable of studying it.

This idea of the fixity of the sun has taken root in such a degree, that to pull it up, there exists no natural power, which would be strong enough. Howsoever the sun may move, while astronomers explore diligently, whither he goes, how swiftly he goes, they seem to think of his fixity, and continue their "investigations and explorations", without drawing from them the least deduction. As soon as they feel in themselves an impulse to make some determination, theory or law, they fix the sun solidly on — the ether. The scholars faithfully repeating, what they have learned from the professor, astronomical writers believe themselves to have done enough, if they respectfully mention the motion of the sun; but all their deductions, conclusions, theorems, explanations, proofs, arguments, laws, etc. are founded on his fixity, according to the system of Copernicus.

It is very striking, that the astronomers of the last century could, and those of the present can yet believe, that such men as Copernicus, Kepler and Newton, had they been conscious of the moving sun, would have stated the same system, the same laws and theories, which they founded exclusively on his fixity, his immoveableness! That in this circumstance there is something to be ashamed of, cannot be denied, cannot escape thinking men.

With great satisfaction astronomers rock themselves in the idea, which has gradually become a comfortable

conviction, that they have regulated the heavens extremely well, all their arrangements being so excellent, that no one can suggest any alteration of them. If therefore one or another arises from their midst — which has occurred already sometimes — saying, that the time has come at last to purge science, to enter upon a rational way and to subject the untenable theory to a rigid investigation and examination, the immense majority of astronómers and mathematicians as with one voice reply “non possumus”. That is the spoken manifestation of the first law of nature: Inertia is the most simple and natural (sic) law of nature which can be imagined. Laplace, *Mécanique céleste* I, p. 14.

From the untenability of the system of Copernicus there results, that all those ideas, notions, theories, which are connected with, or founded on it, all those conclusions deduced from observation and referred to his system are likewise and altogether, without exception, abolished with it. We may still note, that it is impossible to render science a greater and more important service than to overthrow the present system, as indeed the sun has already done.

It seems, that the heaven, weary at length of man's haughtiness, would heal him of his sickness by allowing him to recognise that the sun moves. The medicine is something drastic, the lesson a little severe; pride is broken, vanity crushed, and the ruin — history knows nothing like it — is terrible. To rise up again, man will certainly be obliged to exert his spirit in an unusual manner.

Astronomers, mathematicians and learned men may, however, quiet themselves. The catastrophe will not break forth very soon. Keeping human nature before our eyes we deem it not impossible, that for some centuries

still to come they will continue to teach in books and schools the "true things" and unchangeable laws of this day, as the mysteries of heaven till now revealed !

We cannot bring ourselves to believe, that those astronomers who teach, that the sun has a proper motion, are really of opinion, that the sun must be regarded as "at rest" for theory. What can be the reason of their stubborn perseverance in upholding the Copernican system, at any price, untouched for eternity? Ay, how can it be expected, that the queen of science, praised as the most pure and irrefutable truth, astronomy, which, aided by analysis, penetrates into the deepest recesses of heaven, discovers all its mysteries, shall now, at once, fall down miserably, because her theory does not agree with reality? That requires from our modern astronomers, and from learned men in general, a self-denial, which at present is not to be hoped for. But in time they will, no doubt, be forced to avow, that they are wrong, and will penitently confess: *pater peccavi* !

We shall ever repeat that a basis for a theory of *the* solar system can be got only by rightly perceiving the original type of the celestial phenomena, and this original type is to be found only by observations on the equator.

Will the necessary works and studies for this purpose be soon undertaken on the equator? We do not believe it, for learned men, as we see from history, have ever resisted by all the means at their command the rise of new ideas, if these are contradictory to those already existing and rooted by centennial propagation, and they have persecuted the upholders of them with contumely and fanaticism. Vain endeavour! Truth opens its path, although sometimes very slowly. The Ptolemean intuition

of the world endured undisputed through fifteen centuries, the Copernican intuition of the world is but in its fourth century, it was rejected by thinking men at its very birth, and still now is attacked repeatedly; even genuine astronomers admit it but as a hypothesis. The proper movement of the sun having been discovered, however, the Copernican intuition of the world has become a curiosity, a folly of the spirits of the age, for after the general movement of all heavenly bodies without any exception has been acknowledged, there is required an exaggerated dose of imagination to conceive the sun as immoveable or "at rest."

Infinite space and its content as the celestial mechanism are beyond the intellectual faculties of man to understand, and it is a matter of course that knowledge is replaced by imagination. Theoretical astronomy or what they have agreed to call explanatory science, is but the fruit of imagination.

In order to comprehend the observable phenomena, they have resolved to search after their causes, and to produce these, they have imagined theories which are often devoid of sense and not without contradictions.

It is very indifferent, what ideas one feigns about the mechanism of the heaven, if they are but more or less rational; but one will never attain so far as to be able to affirm that they are the only true explanation of reality.

The ideas exhibited in our pamphlet must contradict those which are taught now-a-day that is inevitable. Are they nearer to the truth? The future will decide.

The observable phenomena look to-day as in old times, but the intelligence of man is modified, it may enlarge, and science will be perfected. What they don't comprehend to-day, they will comprehend perhaps to-morrow, and we are persuaded, that the number of those who will occupy themselves earnestly and attentively with the study of the celestial phenomena, will increase, and then the most sublime object of nature, heaven and its phenomena, will find better commentators than we can exhibit now.

One who doubted the possibility of the Copernican system desired to be enlightened about it, and went to Alexander v. Humboldt, who was indeed ever the first refuge of those seeking information, and was, too, so complaisant, that he sent nobody away, that he even conscientiously answered each letter. The visitor was friendly received by Alexander v. Humboldt, and when he laid before him his doubt about the Copernican system, got for answer the memorable words: "I have known, too, for a long time, that we have no arguments for the Copernican system, but I shall never dare to be the first to attack it. Don't rush into the wasps' nest. You will but bring upon yourself the scorn of the thoughtless multitude. If once a famous astronomer arises against the present conception, I will communicate, too, my observations, but to come forth as the first against opinions, which the world has become fond of, I don't feel the courage."

From Humboldt our doubter went to Encke. Here, indeed, he was not friendly received. In a surly manner Encke declared, that astronomers had something better to do than to meddle with hypotheses; he had no time to teach every one who had any doubts; there were books enough about astronomy, these he should read. The doubter replied, that he had already read the books written for the general public by Littrow and Mädler, but he had found in them no reliable information. Encke remarked

on that, that if these books did not satisfy him, he, too, could not give him further advice.

In 1854 our doubter visited Carl v. Raumer at Erlangen, who avowed to him openly, that he, too, was not fond of the Copernican hypothesis, but had never dared do more than utter vague objections against it. Thus in his. "Croisades" p. 119, where he writes: "Now, indeed, each schoolmaster, according to hear-say, teaches, that the earth moves round the sun, without thinking in the least about exerting himself and his scholars to perceive the planetary movement." When the doubter left Raumer, the latter congratulated him on his purpose of helping truth to her rights, he was, however, doubtful, whether it would in a short time be possible to vanquish the fanaticism of the world.

At Munich our doubter visited Lamont, director of the observatory. Lamont said to him: "You and the world in general are in error: never yet has any real astronomer spoken of a Copernican system, we only know a Copernican hypothesis. Whether this may be true or erroneous, does not matter at all for each genuine astronomer." The doubter replied, that he very well knew that, but then surely one should not abandon lay people to the presumption that astronomy takes the Copernican hypothesis for a truth. "I have never meddled with lay astronomy," said Lamont, "if Littrow and Mädler instill superstition into the people by selling hypothesis for truth, that is their affair."

At Göttingen our doubter made the acquaintance of the astronomer Gauss, who met him in the most friendly manner, aided him with books and allowed him to apply to him at each time, when he thought himself to have need of his counsel. The doubter communicated to Gauss the course of his investigations made hitherto; he told

him of his having found, that all great thinkers, such as Schelling or Hegel, had criticised the transcendental suppositions of the Copernicans, while only little spirits and uneducated folk claimed the right of not only scorning as a fool, but even persecuting with wild fanaticism, him, who did not agree with the chorus of general opinion. Gauss avowed to the doubter that every new discovery in astronomy filled him with new doubts about the dominant system. When our doubter communicated to him that Alexander v. Humboldt had declared that he would likewise arise immediately against the present conception, if some famous astronomer would declare himself against the dominant system, Gauss answered: "Ay, if I were twenty years younger!"

The astronomers of our days (1885) say: Every body will understand, that an astronomer of the present time cannot take up any other system than that of Copernicus, though it were but by the way of trial. They assert, that the system of Copernicus is the only possible one, the eternal foundation of all further progress of astronomy, that with the system of Copernicus the whole of astronomy stands or falls, and that without it we must renounce all explanation, all scientifically founded prediction.

It is strange: even sound intellects yield to that mighty incubus, the spirit of the age!

Is there no renowned astronomer, who has the courage to arise against the untenable present theory of the sun being thought as "at rest", and to establish an astronomy on more rational principles, which agree with the proper movement of the sun?

How long yet shall the great genii disfigure this magnificent, sublime science by their transcendental ideas, and scorn the sound human understanding?

The modern astronomical theory, that is, the explanatory astronomical science, may still to-day be called rightly

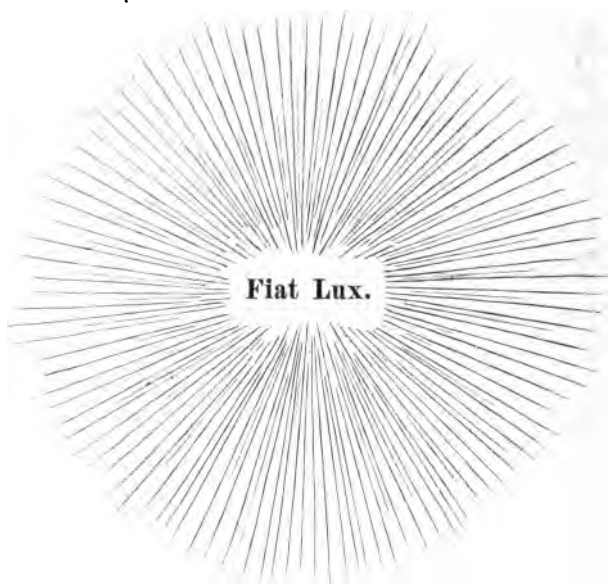
docta ignorantia,

as astronomy was called more than 400 years ago by Cardinal Cuza.

Ce n'est point de s'être trompé que les hommes doivent rougir, mais seulement de leur obstination à ne pas reconnaître leurs erreurs. Fretet, Défense de la chronologie etc. contre le système chronologique de Newton.

To avow that one is wrong, is to prove modestly that one has become reasonable. Swift.

Hypotheses have their time like fashions, and the same courage is needed to profess those the hour of which is passed, as those the hour of which is not come.



APPENDIX.

Appendix.

I.

The heaven or firmament, as it is called, appears almost as a hollow hemisphere, in the centre of which we stand on the surface of the earth, and on the concavity of which that magnificent legion of stars seems to be fixed.

In spite of the astonishing distance of the stars among themselves, in spite of the endless depth of heaven, this latter appears to us as a sphere, a hollow sphere of one piece of crystal — of old style. The opinion has been pronounced that this phenomenon is effected by the atmosphere, one of the qualities of which would be, of course, to round off the heaven. We know indeed, that, whatever spreads around and above us, assumes a spherical figure. The heaven, when partly covered by clouds, still remains for our vision a sphere. If we are enveloped by mist, the boundary of our sight narrows very much, and yet we see continually a hollow sphere, which is changed and renewed with every step we make forward or backward, but in doing so always preserves the same dimension, which is, too, proportional to the density of the mist. The same phenomenon appears to us in the celestial regions: wherever the earth may be in the universe, everywhere the same sphere is presented to us. If we

wander in thought through the wide celestial regions, there opens everywhere another sphere, a new one, and all these spheres of endless number have the same dimension; the apparent size and extension of the vault of heaven remains, therefore, ever the same to our vision. A philosopher once said, that the heaven or the infinite space it occupies might be regarded as a sphere, the centre of which is everywhere, but the circuit nowhere; as there is, however, no centre without circuit, he might have said immediately: The heaven is everywhere a sphere, consequently its centre and circumference are everywhere, too. From these remarks we may conclude, that the heaven is not rounded off by the atmosphere — which is besides rounded off by itself — but that it is our vision which effects this work: for it is bounded equally to all directions, and as our eye reaches necessarily in all directions to the same distance, it meets everywhere with its boundary, the consequence of which is then, that our eye → like us ourselves — must be in the centre of the visible sphere.

Whatever of the heaven is visible to the earth, is in perspective. No absolute direction, no orientation in space. The general movement allows at most but a momentary hold. Whatever abides and moves in space, becomes visible by projection on a sphere which always remains the product of our vision. Each visible object therefore, be it a heavenly body as a point of light, or be it movement, is a perspective projection on the surface of an apparently hollow globe or sphere, the geometrical qualities of which are known and which is the basis of the astronomical observations.

The heavenly sphere in itself is, however, our vision bounded in all directions, and considered thus the sphere

itself is bounded by our vision, its apparent extension — greatness — depends on the power of our vision, if one could measure this power, determinate it accurately by numbers, the dimension of the visible heavenly sphere would be known. The stronger the power of vision or our eye, the more the space of heaven extends itself, and the telescope, strengthening the ability of our sight, enlarges at once the sphere and increases its content. With each extension of the sphere there opens a greater depth of heaven, and the angles of vision are extended in proportion to the enlargement.

To each distance from the earth there corresponds another circle, another sphere. The sun moves apparently in a circle 410 times greater than the moon, and if one of the stars nearest to us is 200 000 times more distant than the sun, the circle described by it will exceed that of the moon 82 million times. It is probably this circumstance which led the ancients to the idea that the many consecutive heavenly spheres were, so to speak, encased one into another. The same succession of ideas has induced modern astronomers, to imagine the various circular orbits of the planets inclined to one another in the same manner, as if they had planes which cut one another in different points, transpose themselves one on another, have their poles and describe with them geometrical figures on the heaven.

It must be remarked, that, as the heavenly bodies and the phenomena connected with their movement are in the same manner projected on this sphere, whatever may be their distance from the earth, the moon near us in just the same way as the smallest or apparently most remote star, the study of this sphere, totally neglected till our days, must give important disclosures about many celestial phenomena.

Each visible object or phenomenon is, with relation to its apparent position, more or less affected by the motion of the earth. This "more or less" depends on the distance of the object as well as on its relative situation to the direction of the moving earth; each translocation, linear and angular, is consequently projected on the heavenly sphere and is there seen perspectively.

The solar system itself appearing but as a point in the midst of the heavenly hollow sphere, it is very probable that the heavenly sphere offers the same aspect to all bodies forming the system; each planet sees therefore the same constellations and stars, the proper motion and translocation of which will be too the same for each planet — with regard to time. It is not the same within the system itself, each planet sees the other bodies of the system in other places, in other projections and perspectives.

Here Thus, for example, for that body which is nearest the sun, are no inner planets, no conjunctions and no solar eclipses; for the most remote one, in the contrary, there are only inner planets and nothing but conjunctions, for it all other planets and their moons may possibly appear on the disk of the sun. But it is very probable, that Mercury as far as Neptune is invisible, as this little planet seen from that other, never deviates more than 46 to 50 seconds of an arc from the sun.

All heavenly bodies transpose themselves with relation to another exactly in consequence of their own movement. The translocation therefore as well as the movement is a general one.

To these real or proper translocations there must be added the apparent ones, in consequence of the earth's motion as well as of the translocation of the solar

system. If we remember that the earth besides its rotatory motion describes a doubly bent curve round the double-curve of the sun, it becomes evident that the relative positions of the heavenly bodies are perpetually changing, and that to find out their proper movements one must necessarily know, how far their total movement is affected by that of the earth and sun, that is, one must know the movement of the earth and sun as well as the effects they produce.

From these few remarks we may recognise, what immense studies have to be made to enable us to comprehend in general and to perceive rightly the phenomena of the movement.

According to the nature of the sphere all objects projected on it, all points of the starry heaven, even these, which in reality are far beyond the apparent vault, must to our vision appear to be at the same distance. The consequence of this optical effect of our vision is, that the earth is ever in the centre of the sphere or heavenly hollow sphere, whithersoever it may be conducted by the sun. But now, the earth is itself a sphere, one may therefore imagine it to be a little globe in the midst of a great hollow sphere. Surrounded and enveloped in this manner, to every point of the surface of the earth (the inner sphere) there answers a corresponding point of the heavenly sphere (the outer great hollow sphere). From this circumstance it is evident, that the heavenly hollow sphere, taken as a whole, has for each other point of the earth another appearance, and therefore all heavenly phenomena, according to their different points, show themselves differently. Apparent and angular distances, movement, direction, aspect, configuration etc, all vary and change with the changed position of the observer, and it

is absolutely impossible, that two or more observers, being perceptibly remote from ^{each} another, can see accurately in the same manner a phenomenon observed by them at the same time: each one of them will perceive in the phenomenon something different. This circumstance is a universal one and without exception, and in the strict sense of the word even a very little distance of two observers produces a different result: the matter is therefore, with what accuracy and delicacy have the observations been performed.

Of such observations as have been made in different countries or "parts of the world," there often arises the question, which of them has better and more accurately indicated one or the other phenomenon. From the difference of the results they have got, they often infer a greater or less precision in the observations; with a little reflection we shall find the true cause of most of the differences, even if we lay no great stress on the correctness of the watches employed, which cannot in any case agree with each other, or on the accuracy of the time as determined by calculation.

It is very remarkable and of high importance, that the heavenly sphere is a true copy of the geometrical surface of the earth. All points, lines, circles of the earth are to be found on the sphere of stars; the copy is perfect and extends to the minutest details. Thus e. g. the visible heavenly sphere is flattened, a spheroid, a magnified form of the little earth; thus the surface of the earth is totally projected on the heaven, as well as its movement without exception. As the earth thus, as it were, graphically transfers all its geometrical and mechanical qualities to the heaven, its image is by this means perfectly reflected. The velocity of its rotation, for example, different for each

point of its surface between the equator and pole, is found in the parallel circles of the heavenly sphere, which correspond to those of the earth, in such perfection, that by accurate observations made in this sense one might find, how the heaven itself indicates the flattening of the earth, and this only by the difference of the velocities, which belong to the equatorial parts of the earth by the rotation.

This sublime, remarkable phenomenon, that the surface and movement of the earth are accurately copied by the heaven, has never been the object of study, simply because explanatory science seems to know nothing about its existence. That the equator, ecliptic, parallel circles, axis of the world, and the poles of the world, correspond to those of the earth, is about all that theory knows. But it is just this magnificent phenomenon which explains many other great and small phenomena; it explains, beside other things, the variable velocities of the sun in the ecliptic, it explains partly the variable diameters of the sun and moon; nay, it discloses, why some astronomical instruments, as, for example, the parallactical ones, among them especially the equatorial, will not do good service and will not indicate the cause of their doing so.

This true, wonderful reproduction of the spheroid of the earth and its surface offers us a view of the most delicate mechanism of the heavens; it informs us about such phenomena as the imagination is not enabled to comprehend. Whatever may be the position of the earth in space, the reproduction is always and everywhere a perfect one. If the axis of the earth or its pole is directed to Sirius, Sirius is the polar star; if the earth is inclined to it at 90° , Sirius is in the equator, and so

on. The least displacement of the earth is therefore indicated by the heavenly sphere, but the earth transposes itself in space incessantly, and its situation changes in consequence of the motion of the sun. Whatever to the theorician seems to be disorder, irregularity, inequality, anomaly, disturbance etc., is the most perfect harmony; but the general movement is not to be explained by the laws of attraction.

II.

The earth, thrown into universal space with its double movement, communicates, so to say, to the heaven its geometrical qualities; its poles, lines and circles are adopted, copied by the heavenly sphere.

The axis, poles and equator of the earth transform themselves into the axis, poles and equator of the universe. Its parallel and horal circles are drawn on the firmament, on the apparent heavenly hollowsphere; its longitudes and latitudes become right ascension and declination for the shining and light-giving points of the heaven, the heavenly bodies. But as to the ecliptic and its poles, the earth does not know them: these arise from the apparent position of the sun.

The horizon and zenith like the horal circles (meridian) are the property of the observer, that is, to each point on the surface of the earth there answers its own horizon, zenith and meridian, which transpose themselves together with the observer in consequence of the motion of the earth.

The celestial maps and globes, a kind of topography of the heaven, serve for nothing but to represent the apparent and relative positions of the stars among themselves; they show us the distribution and arrangement of the constellations, and, in general, the firmament, as it appears seen from the earth; if we should expect any-

thing else from them, we should lose ourselves in the infinite.

A terrestrial globe is a true image of this planet, for the matter is here particularly the surface of the sphere, and whatever may be the size of such a globe, it always remains in a calculable ratio to the size of the earth, while a celestial globe of paste-board is mere nonsense, as infinity cannot be reduced and in all its — ideal — parts ever remains infinite.

Let us, for example, assume that to construct a celestial globe, beginning from its centre — the place of the earth — we give the distance of the sun the value of a millimeter. The diameter of some sixty millimeters for a globe which includes the known solar system, will surely surprise nobody on account of its size; but if we wish to find room for that fixed star deemed to be the nearest to the earth, the diameter of the globe increases instantly to as much as 1200 metres; if we wish to include by degrees the stars of 22nd, 3rd, 4th, 5th, 6th magnitude, the globe of paste-board will forthwith surpass the dimension of the earth, and thus, with the distances of the following stars, extend into infinity.

In general, celestial maps and globes represent the stars with their constellations, as they appear to us projected on the surface of a hemisphere; the marked distances are angular distances, for astronomy itself cannot bring into account the diverse directions in space. But now, as the starry heaven is neither a plane, nor the surface of a globe, the real positions and planes, like the relative distances of the stars from another, cannot be recognised. The 6 or 7 stars, for example, which represent the Great Bear, appear to us in the same plane of the firmament, they are equally projected on the apparent sphere, on the

apparent heavenly hollowsphere, and yet each of these stars may belong to another plane, or, as the ancients imagined the heaven to be composed of many spheres encased one in another, to another sphere or concentric globular surface; which surfaces are also at enormous distances from each other and may be independent of the apparent angular distances.

As to the distance of the stars, we have only ideas about it, but no knowledge. According to these ideas the distance of the stars is very great: the star nearest to the earth is said to be represented by the number of 7 billions of miles (à 4000 meters).

Although we cannot think that there are two stars, the distance of which is the same, still we may assume, on this hypothesis, that the linear space between two stars which are diametrically opposite on the heaven, amounts to at least 14 billions of miles; transferring this line to the celestial hollowsphere and deeming it to be its diameter, we may conceive that the sun with his system is always in the centre of the celestial hollowsphere as it appears to us, the consequence of which is, that either his translocation in space, with reference to the starry heaven and the stars, is imperceptible, or that there is taking place an equable general translocation of all heavenly bodies.

For a star which is nearest to the earth even the sun appears as a little sparkling star; the planets, his retinue, will be hidden by his refulgence (irradiation) and be invisible; the movement of the sun will for the observing star show almost the same angular velocity, which from the earth is observable for this star.

For the earth, however, this space occupied by the solar system is important; according to the notions of

our day it extends from the sun as far as Neptune, a distance which represents by the way 1184 millions of miles, the 12 200th part of the distance of the two stars which are nearest to the earth. To pass through this distance which separates us from one of these two stars and which we imagine to be the semi-diameter of the heavenly hollowsphere, the sun would, with a velocity of 4 miles in a second, have to spend about 55,5 millennia.

Now, if the student asks: "Pray, where is the fixed sun to be found on the celestial globe, be it of paper or real?" how and what will the professor answer? Will he say, that the sun is not fixed, but moves round the celestial globe in the ecliptic — which is very well delineated on the globe, and that his positions during the time of his revolution are noted accurately for each day, that he crosses the equator twice in a year etc., or will he say that the sun is fastened inside, in the centre of the globe, which centre is at once the focus of all ellipses, parabolas and hyperbolas, in which the planets, moons and comets move round the sun, that therefore the movement of the sun is but a semblance?

It is very probable, that the professor, to avoid committing any mistake, says both, the one and the other.

III.

In several books there is ascribed to the solar movement no other result than the parallaxical change of some constellations or configurations, namely the amplification and extension of those towards which the sun, as he approaches, directs himself; and the diminution or contracting of the opposite ones.

Astronomers have accustomed themselves to the idea, that the sun — with reference to his system — may be considered as fixed, imagining that it is the unchangeable orbits which cut through the centre of the sun, and move forward together with him; the planets bound to these orbits are not brought into account at all.

Farther it is taught in the books, that up to ^{the} present time no one has yet discovered or observed any phenomenon indicating the motion (path) of the sun.

But now, pray, how do people expect this motion to manifest itself? If they would be sincere, they must say: "Although we do almost exclusively observe the movement, yet we don't study it," for the fact is that studying it seriously leads to the acknowledgment, that there is not a single phenomenon, which does not more or less indicate directly or indirectly the movement of the sun. If therefore one cannot yet produce such observations as speak intelligibly and distinctly to everybody, it does not at all follow, that one must ignore the movement of the sun.

To this insufficient comprehension we prefer the categorical declaration given by some astronomers, according to which astronomers do not meddle with absolute movement in space, but consider only "relative movement", as for example the movement of the planets relative to the sun.

"Absolute" and "relative" are intended here to be synonymous with "true" and "apparent". The word "apparent" signifies that we cannot see and observe the phenomena of the heaven otherwise than they represent themselves to our vision, appear to our eye. In astronomy this word has no other meaning, but it does not the less indicate, that the phenomena may well be of other kind than they show themselves to us.

Now comes the question: does theory believe that the absolute movement of the planets in space is not relative to the sun, or does it believe that the movement of the planets, being relative to the sun, does not occur absolutely in space? By establishing the sidereal times of revolution the astronomers prove, that they don't view such a movement of the planets as is relative to the sun.

The practical astronomer is bound to consider only the relative apparent movements and to take these for the basis of his calculations. If he removes but in the least degree from the apparent, his calculations — especially if they are to be a prediction — have no longer any value; for only the same apparent will appear another time.

The practical astronomer has nothing to do with the theory which looks for the Why of the phenomena; it is of no matter to him, whether the one or the other system has been adopted, these or those laws have been

decreed, of no matter therefore, whether there are system and laws or not: he abides directly by the heaven itself, and he does well.

But now even the practical astronomer may be seduced to derive conclusions from observations and their numerical determinations, which are defective in that very point he does not study, and that is the absolute movement.

The reality of the celestial phenomena can be inferred only from apparent things, as the true movement does not permit any direct observation. But by supposing that the reality is represented by the system or by the laws, we enter on the converse method and get no useful result, we shall even recede from our aim. So it becomes evident, that astronomers, in opposition to the above categorical declaration, don't take into consideration those movements of the planets which refer to the sun, as they make their observations in the sense of the postulated system, and refer to the stars not only the time of revolution, but also the rotation of the earth.

Now, if the sun and the stars are equally fixed, the movement of the planets must be equally relative to both, and no difference can take place between the sidereal and other revolutions, but as for example "sidereal" and "tropical" are two different things, and astronomers grant the preference to the stars, they just prove that they don't comprehend the movement of the sun and his system, that they have not perceived the manner of the transition from apparent to real things. Now, if astronomers, content with the planes and surfaces, will not meddle with studying absolute movement in space, they may also spare themselves the trouble of explaining and demonstrating the phenomena, propounding theories and enunciating laws.

The observations of the stars, continued since Bradley with zeal and ability, have proved clearly, that their right ascension and declination are subject to annual changes, they have proved, that these variations continue without interruption. An especial case of the continually increasing right ascension of the stars is that phenomenon which we have known for two thousand years by the name of precession of the equinoxes.

This uninterrupted transposition of the stars on the firmament and their coordinates in right ascension and declination teaches us that in truth there exists neither a precession or advance, nor — as it is found in the books — a retrogression; but there exists — if one will call it thus — a precession not generally equal, but common, in which the whole starry heaven seems to remove or transpose itself, change its place in space, in consequence of the solar system being dislocated in space. The general precession is therefore called

“Solar movement.”

The phenomenon is indeed simple: even as we are varying, changing our situation or position (place) in space, the vault of heaven offers us another aspect, a changed view, and the question about the direction of the movement of the sun is reduced to the question about his orbit; to the discovery of this orbit we shall be led by the study of his movement, which has been already made observable partly by observing the stars, partly by, what even now is unknown, the motion of the earth.

The system of Copernicus, the laws of Kepler, and Newton's theory of gravitation or laws of attraction are the basis of the astronomical theory, and it is admitted; that these three doctrines, supporting and proving one

another reciprocally, make up one and the same whole. After these three immortals, their followers had nothing more to do than to produce their arguments in such a manner as the system of Copernicus and the laws of Kepler and Newton require, that is to say, heaven and nature must comply with human imagination. Now in this manner Laplace could say, that the system of Copernicus and its correctness with each new theory, each analytical inquiry became firmer and firmer, until at last it attained the highest degree of certainty.

Now, if an astronomer should say that "the system of Copernicus is the only one possible", he means that the solar movement is an impossibility; if he says, too, that with the system of Copernicus the whole of astronomy stands and falls, he means that before Copernicus astronomy did not exist and after the fall of his system will once more not exist; he means further that the true astronomy is, what they have imagined about the heaven and the causes of the phenomena.

If astronomers had merely presented their ideas and opinions to the world as such, and no more, no one could raise any objection; ~~by~~ they lay down their opinions in words and on paper as a positive science, they give their views as incontrovertible truths, and this fact alters the situation, for we cannot admit that science is a mere barge to be taken in tow by the imagination.

IV.

The position taken by the sun in space cannot, seen from the earth, surpass his apogee; if therefore they enlarged the apparent ecliptic to a great heavenly circle, they did so in consequence of a false application of geometrical relations to the heaven. We know that a circle, being in space, from that of the rotating earth up to that of Neptune, produces the same effect on the starry heaven: they appear all as great heavenly circles, which don't exist in reality.

Neither the sun, nor the earth are moving in the ecliptic, none of them describes a great circle. The solar system takes a very diminutive place in that space, which the apparent heavenly sphere, the apparent heavenly hollowsphere includes, it is, however, inevitable, that whatever is visible in space, projects itself on the sphere, on the apparent heavenly hollowsphere, the consequence of which is now, that the apparent ecliptic cannot be anything else than the trace of the successive projections of the sun on the firmament, on the apparent heavenly hollowsphere.

As the greatest celestial circle the ecliptic has nothing to do at all, it accompanies the system wherever it goes, its projection is always a new one, its place is therefore changing every year, even every day, every moment, it

changes even its inclination to the equator, its obliquity.

The orbit of the earth derived from the declination of the sun, or rather from the apparent solar movement, theory has made the ecliptic or solar orbit and has raised this to a great celestial circle, which is equalled by only one other great celestial circle, the celestial equator, and even surpasses it in importance. The notions given by theory about the ecliptic are unintelligible and confused, as theory itself does not know, what the ecliptic is. Now it is the solar orbit, the circle, in which the sun moves, which he never leaves; then it is the orbit of the earth; again it is a great circle inclined towards the celestial equator. The two great circles — equator and ecliptic — cut one through the other in two opposite points. The ecliptic has its plane, axes, poles standing off the poles of the world $23^{\circ} 5'$ and describing geometrical figures. As long as the ecliptic represents the orbit of the sun or alternately the orbit of the earth, it must be an ellipse and has, of course, two foci, two axes and four poles, but after having become a celestial circle, it loses one of its axes and one focus, being thus enabled to rival the equator even as system of coordinates.

The obliquity of the ecliptic decreases periodically and is subject to secular changes. It makes therefore variable coordinates; nor has it latitude, as the sun is ever in the ecliptic, for in the system of coordinates the latitudes are relative to the ecliptic. In this case the ecliptic is therefore at the same time ellipse and circle, at the same time orbit and great celestial circle. If the ecliptic becomes exclusively the orbit of the earth, it has triple character: it remains solar orbit and great

celestial circle too, the consequence of which is, that the earth and sun are moving in the same circle of ellipses and in the same direction. From this definition we can neither draw conclusion respecting the orbit of the sun nor that of the earth.

The confusion respecting the ecliptic appears most distinctly in the conception they have formed of the periodical movement of the earth as well as of the axes of the world. Namely the axis of the earth describes a circle round the pole of the ecliptic. Connected with the precession the pole of the world describes a circle around the pole of the ecliptic in 26 000 years, in consequence of which diverse stars arrive by degrees at the place of the present polar-star. Now, as the imagined pole of the ecliptic is distant $23^{\circ} 5'$ from the pole of the world, this describes a circle, the diameter of which has 47° ; the consequence of it is, that the present polar-star after 13 000 years will have a declination diminished by 47° , as it inclines by this arc to the south. But as the celestial equator is ever perpendicular to the celestial axis, it too must unquestionably incline by 47° farther to the south. But now the wonder emerges: the ecliptic remains on the same place with its planes and poles, it does not move at all, its axis and poles continue to be parallel to themselves. The stars, the declination of which has changed by 47° , retain their old latitude unchanged; but the still greater wonder is, that, while the celestial equator transposes itself by 47° , the celestial ecliptic has always the same inclination to it! If the inclination between the axis, equator and ecliptic did really take place, the inevitable consequence of it would be, that the declination of the stars would change in the very same manner as that of the sun. It is known that this is not the case. The

apparent positions of the sun during a revolution of the earth are, as we know, perspective projections on the celestial sphere, on the apparent heavenly hollow sphere; neither this heavenly hollow sphere, nor the stars which are visible on it have anything in common with the declination of the sun, which, with its extension of 47° , for the starry heaven amounts to only some seconds.

V.

Kepler must have known that the observable orbits are perspective projections, and that an inclined circle may present all possible ellipses up to the straight line, just as the inclined ellipse may project a circle — but only one. He must have known that all the more since he says, that if men could see the orbit of Mars centrally, this too would then present itself as an ellipse. Now, as it is hard to transplace one's self in such a manner as to view the centre of the orbit of Mars, one must take Kepler's word for it, that this planet does describe an ellipse.

Closed orbits and their planes were the basis on which Kepler grounded his opinion; he could not sever himself from the system of Copernicus, for it belongs — his opinion that is — still to the dogmas of astronomy. Kepler could not therefore suppose that all projections on the surface of the firmament can have but two dimensions. As a sphere projects itself as a circular disk, so lines of double or manifold curvature will project themselves as simple curves. Thus, for example, a cylindric spiral will, in its central projection, appear as a circle, but projected lengthwise it will show itself as a serpentine. From the projected movement alone no conclusion can be drawn as to the figure really described by the body. The

celestial bodies cannot move in space in simple curves, but the figure they describe always projects itself in two dimensions.

With his ellipse Kepler has led theory into a labyrinth, from which it can never escape: the important question of the difference between the angular and virtual (linear or spatial) velocity clearly gets into confusion, as well as the question about uniform or variable movement.

According to the principles of mechanics, a body moving in free space can advance only with uniform, of course the same, velocity; if it does not, there are either retarding or accelerating forces which influence it. Astronomical theory acknowledges on the one hand a uniform motion of the celestial bodies, but postulates on the other hand a variable velocity.

If a body moves uniformly in a curved line, its angular velocity is proportional to the curvature. The greater the curvature, the greater is the angular velocity. The ellipse is an unequally curved figure, in which the curvatures of those parts which are diametrically opposite are equal. At the two endpoints of the major axis — the apsides — the body will therefore have the greatest — but equally great — angular velocity, and the least velocity on those points of the curve answering to the minor axis.

If, for example, the sun were to describe an ellipse with uniform movement, he must have in his apogee the same angular velocity he has in his perigee, but must move the most slowly in the equinoxes. Observations say that the sun, or the earth substituted for him, moves quickest in winter and slowest in summer, that his angular velocity attains its maximum in the perigee (the perihelion of the earth) and thence diminishes gradually until the

apogee (or aphelion) to increase again in the other half of the orbit. The immediate consequence is, that the question is no longer about the angular, but the linear velocity, which must be variable.

A planet cannot — according to the preceding — move uniformly in its orbit, it cannot of course in equal times pass through equal spaces, but through spaces proportional to its variable velocity. That the angular movement is proportional to the curvature is understood of itself.

The ellipse being elevated to a law, they were obliged, to attain their end, to place the sun in the plane of a planetary orbit, and they chose, with much circumspection, to locate it in one focus of their favorite curve, as from this spot the planes are described by the radius vector. Now we must clearly imagine the radius vector to be the stretched thread (*fil tendu*) joining the centre of the sun with that of the planet, for example, the earth. This thread must, in order to do its duty properly, first lengthen and then contract again. It is indeed hardly to be understood, how a force, the attraction, the quantity or greatness of which is given by the invariable mass (for example, of the sun and earth), can increase and decrease alternately. But if we add too, that the swiftness of this force is infinite and its permanent action consequently momentary, which Laplace demonstrates by analysis, we get into confusion.

What is the reason, what is the cause of a force being diminished, the greatness and action of which is constant and momentary, the swiftness of which is infinite? This is one of those questions, to which natural philosophy (physics) gives no answer.

VI.

Centrifugal force — as a force — does not exist in nature, it is an imaginary force.

The science of mechanics teaches that centrifugal force generates itself together with the revolution, and that, if there is neither rotation nor circulation, there is no centrifugal force; it only remains for mechanics to teach us, that the movement is not produced by the force, but inversely that the force is generated by the movement, and that the movement changes even the nature of the force. According to the view of mechanics the impulsive force, which has produced the rotation or circulation, changes into centrifugal force, which disappears as soon as the rotation ceases. The centrifugal force of terrestrial mechanics was by the great scientists transferred to the heaven.

If the material parts of a sphere which is in rotation are not hurled into universal space, it is on account of the cohesion, the compactness of matter, the heaviness or attraction, but principally because the rotation does not proceed quickly enough. A celestial body circulating in free space, which describes its revolute curves, may of course lose itself in infinity, if it is not restrained by something, they are therefore obliged to call to their aid the sling, the stretched thread, in one word centrifugal force, in order to check the annihilating centripetal force. The higher geometry has tried to metamorphose these two

forces, by taking the tangential velocity and central attraction for their equivalent; according to new determination both forces influence each celestial body together, equally and in the same measure, they are opposite, they abolish themselves mutually, they annihilate one another.

To postulate forces acting against ^{one} another, contrary ones, is to annihilate directly each movement; one has therefore no need of their permanent action. But why contradict fundamental notions, why deny them, if they are proved by fact and don't change?

The "resultant of forces" having been propounded as law, there is but one action, one force. It is by the action of mutual attraction, of perturbations, that theory has simply abolished the first and capital law of mechanics about the action of forces.

With reference to centrifugal force, the rotation is often changed with the circulation. It is a matter of course, that both movements are made round the centre; as to the circulation, this circumstance is explained by the sling, for by this the circulation around the centre is obtained by force, the body has been forced to describe a circle*), says mechanics. But is not a slinging motion rather a rotation, than a circulation? Translation alone is generated only when the impulsive force hits the centre of gravity of the sphere, in which case all its molecules move with equal velocity; if the force produces a rotation, the molecules get different velocities, the centre of gravity has however in this case been influenced but partially, indirectly, by the force, which is aiming at a point of the axis. The farther this point is distant from the centre, the greater becomes the velocity of rotation,

*) But an ellipse cannot be produced with the sling.

which attains of course its maximum, when the force influences the end-point of the axis.

Now, if the mechanics calls circulation the movement of the stone which is in the sling, it has forgotten the essential difference between rotation and circulation, for it can hardly fail to be understood, that every point of the stretched thread has another velocity, which attains its maximum at the end of the thread — of course at the stone. The movement in the sling is therefore a rotation, it is that of a flying wheel: it is from the centre — where it is the least — that the velocity of the axis (stretched thread) increases up to the surface or circumference of the wheel (stone in the sling), where it attains its maximum.

It is evident, that those parts of the rotating sphere, which are provided with a greater swiftness, endeavour to part from those, the swiftness of which is less — for they will advance — that therefore the elevation of the equator and the depression of the poles is an inevitable consequence of the rotation.

VII.

Inertia is the most simple and natural (sic!) law of nature, which we can imagine. Laplace, *Mécanique céleste* I, p. 14.

Now, what is this inertia of matter — promulgated as the first law of nature? Absolute passivity, perfect obedience, total senselessness, want of feeling, indolence etc., in one word the incarnate “non possumus”, and all that in order to allow other men to act, and at the same time to submit one’s self to the action of any force whatever, to follow each impulsion.

Can these qualities really be found in matter? It is neither to be compressed, nor to be extended without resisting, but resistance is a force itself, and it was not without reason that the ancients said “vis inertiae.”

Matter has the inclination to be a whole, its least parts — atoms, molecules or dust, it makes no difference — attract each other, in order to aggregate themselves round a common centre or centre of gravity; they squeeze, they join one to another, matter is therefore provided with the attracting force, it is itself a force in continual action, it cannot therefore be inert.

The activity ascribed to the parts of the earth is but apparent and relative, each part of matter, whether it be in the interior or on the surface of the spheroid of the earth, is attracted by its centre or centre of gravity, which

centre is, on its part, attracted by each particle of matter, but the whole is in an uninterrupted movement and each molecule of the squeezed matter participates in the double movement of the earth. But whatever moves, cannot be inert.

Any heavy body soever, for example a piece of stone, slung vertically, falls back to the surface of the earth, and they imagine, that the falling body, if not stopped, would penetrate as far as the centre of the earth.

By what means, now, could the fall of the stone be hindered in such a manner as to cause it to stop floating in the air? Certainly by a force, which is like the attraction of the earth, influencing the stone in a vertical direction, by an opposite force, therefore, which should act directly from the centre of the earth; which is as much as to say, that, the attraction being annulled, the stone remains floating in the air, at a height or distance corresponding to the throwing force; but this kind of suspension is not yet fixity, for the stone, being in the air, will continue to partake of the rotation as well as the translation of the earth.

But now, how might a spherical body be fixed in universal space? By the action on its centre of as many equal forces as there are directions in space, and these numberless forces, united in its centre, produce the very same effect which the central attraction of a sphere exercises on its molecules: whatever may be the source which the supposed forces arise from, yet these cannot hinder the celestial body from moving forward, that is gravitating with the other celestial bodies, as the effect produced relates but to the proper movement of the body. The consequence is that, to form a good idea of the fixity of a celestial body, one must postulate a general fixity,

of course a fixed universe, as the forces acting according to the hypothesis can only proceed from fixed bodies. In this manner we arrive at the idea of an absolute immobility, at the idea of universal inertia in consequence of the repulsion. Does it not become clear, that with much more reason we may say, that the first and most simple law of nature is motion?

For the astronomy it is very indifferent, whether one does, or does not, imagine an inertia; science sees nothing else but the movement and cannot imagine, how a celestial body can be suspended motionless in space. The fixity imagined by the theory is besides no more in vogue.

VIII.

It is little more than three centuries ago, that an explanative science began to form itself, that men asked for the "why" of phenomena. The historians of astronomy attribute great importance to this epoch and believe, that with it investigation, the highest function of the mind, awoke from a sleep of twenty centuries. But if the mechanics of the heaven were regulated, the universe would prove to be a great disorder, a total confusion; an unpardonable disobedience would manifest it.

Now they were obliged to ask for the reasons, why the phenomena of the celestial bodies as well as the whole heaven show a hostile behaviour and will not obey the laws imposed upon them.

Velocity once acquired does not change, the permanency of the distance is warranted, the quiet, ever equal course is secured, the almost-circles may so easily be run through, the well-traced orbits are like rail-roads, the sun does not move etc. etc.; now what may be the reason of the irregularities? There must be some deadly enemy of established order, whom one must discover as soon as possible at any cost.

It is Newton who answers the why, it is Newton who finds the disturber who is the sole reason of each disorder, each anomaly, each disturbance, and this disturber — an astronomical Proteus — calls itself attraction.

Attraction points to a force, there is no doubt of that. The universal attraction presupposes a universal force, which, as such, cannot be without activity, as its action extends to all celestial bodies. Now, if we can know, how and in what manner this force is exercised, the irregularities will explain themselves. Newton has decided, how attraction is to behave and demean itself, and it is with him and according to him, that learned men have demonstrated "all with the most astonishing evidence."

The same Newton maintained the position, that we ought not to believe anything which is not proved. But how does one get the proof; how does one acquire the persuasion, that the proof is indeed a proof? Facts, like truth, have no need of proofs, for they are stronger than these. In astronomy they make or produce the argument and are content, they are pleased with having furnished it. But it is hard to comprehend the phenomena, to understand their meaning, it is hard to recognise the observations, it is altogether impossible to comprehend them, as long as one retains the fixed ideas about the solar system and the nature of forces in general, but especially those about attraction.

The theory of attraction and the application of its laws to the proofs of the "why" of the phenomena do not satisfy reason. It is on this account, that many people have some aversion to attraction, and say plainly that it does not exist. They have, too, repeatedly substituted other forces for it, without considering that by substituting one unknown thing for another there is not made any progress.

The attraction of the earth, for example, is observable on its surface; by observing attentively its phenomena one

may be persuaded, that an attracting force exists really, and it is permissible, it is even reasonable to think, that the other celestial bodies — which are likewise supposed to be material — own the same force. But if the existence of an attractive force is no longer doubted, there still remains unsolved the great question, in what manner do the celestial bodies act one on another. Whether this be answerable, is another question.

It is by their mutual attraction that the atoms strive to unite themselves and form that material body, which includes their totality. Now, the mass of this body contains the sum of the attraction of all its atoms, the consequence of which is, that the attraction of a body is proportional to its mass, proportional to the accumulated matter. From this position they conclude, that one body acts on another body, which sum — as we see — is represented by the quantity of the atoms. It is certainly intelligible, that the quantity or greatness of the attraction exists in the body and in an amount, too, proportional to its mass. But if the molecules apply this immanent force to attract each other mutually, to maintain their mutual contact, they can no longer, either singly or collectively, influence another body and its atoms with the same force.*)

*) The sun, in truth, influences the earth (according to the theory) in as many ways as it has molecules; he influences single parts of the earth, or does not, but he is not hindered by this from attracting the centre of the planet according to the law of quadrate. Is it not a wonderful invention, this of a variable attraction, which is at the same time both stronger and weaker? In the theory of the tides, for example, attraction does not act according to the square, but to the cube of the distance; the moon exercises on the earth a stronger attraction than the sun. In the two theories of precession and nutation the manner of attraction is still more

As a distinctly observable phenomenon attraction defines itself. Attraction appears ever in the same manner: the final result of its influence is, that two bodies approach and unite which each other. The approach and final union cannot take place without motion, the consequence of which is, that the attracting force is at the same time a moving force. Experience has taught, that some forces as magnetism, electricity, light etc. not only attract, but also repel; they have been called polar forces, and their opposite directions have been denoted by positive and negative. To repel something is to remove it, and there appears again movement, which therefore is inseparable from attraction and repulsion. The mutual action of the forces on each other and on matter can produce attraction, if there did not yet exist any, it can strengthen and weaken the existing attraction, generate light and warmth, magnetism and electricity; this latter is especially and powerfully the potential cause of the power of the magnet, and all bodies or substances may — with a few

astonishing; there the sun chooses certain parts of the surface of the earth, on which he acts arbitrarily in order to produce the precession; but he does not act at all on the same parts in order to produce the nutation; acting and not acting together might be more than a — miracle.

But how are these and many similar incongruities to be reconciled with the accurate determinations, demonstrations, principles, laws etc. which they have produced with so much pains? After having proved, by the omnipotence of analysis, that the sun acts on the earth — a rotating spheroid — in such a manner, as if the entire mass was united in its centre, that all its parts, the totality of its molecules, of course its water and atmosphere too, must be considered as belonging to the solid mass, and are, consequently, also united in the centre; after having proved clearly, that the sun acts on the earth and its moon as if these two bodies were united at one centre etc. etc., they allow the sun to act arbitrarily in this or that manner, on these or those parts separately!!!

exceptions — become magnetical or electrical, or, if they possessed these qualities latent, attain to their manifestation.

The action of forces working upon and in another — called correlation — may raise the thought, that it is the very same natural power, which is but represented to us in its modifications, and that we cannot but take these modifications for distinct separate powers independent of one other. Which of these modifications is nearest to that true power, which effects the attraction, we cannot decide, as we do not know the force. Nor does the word "attraction" signify the force itself, but its expression, its effect and, if we may say so, the result of the acting force. Now, if two bodies attract one another with unequal force, the less must no doubt concede the preference to the greater; that is to say, if matter is falling, moving, attracting etc., the lesser mass must fall into the greater one, and not inversely. Thus a little magnet will not attract a greater mass of iron, but will itself rush towards it; in this case the iron attracts the magnet. But if a little magnet is fixed, it will be capable of attracting a much greater mass of iron. The idea of mutual attraction being stated as a general position, the notion of attracting forces falls away and the magnet, which attracts the iron, is attracted by it in the same manner. Now, if two bodies attract one another equally, we can no longer decide, which is the attracting one, and which is the attracted one. In consequence of the fixed sun always attracting, all planets would be forced to fall upon him. Now, to escape this inevitable catastrophe — which is rendered necessary by the system of Copernicus combined with the central attraction — they must think of means, and they invented the centrifugal force. As long as

the sun is fixed, they can hardly do otherwise than abide by this imagination, for the celestial phenomena are incomprehensible. As the movement takes place in space, we have no idea of it. But now it is recognised that the centre is moving; we find that the sun advances in space, swiftly enough, and as he has yet a great disk, and it has not yet been observed that he diminishes, so as to become at last a fixed star to the earth, it may be verisimilar, that the earth follows him, or that the sun carries his system with himself. But if the centre moves, there are no closed curves, no orbit and of course no plane of orbit remaining on the same place in space, the circulation exists it is true, but it is not made round the centre of the sun and the radius of the curve of revolution is no longer the distance of the sun.

When it is said that the proper astronomical science is the theory, that is the doctrine of attraction, which impresses on this science the stamp of infallibility, that this doctrine explains perfectly the mechanism of the heaven, after penetrating, with the help of analysis — which demonstrates everything clearly — into the sanctuary of the universe and revealing all mysteries etc., one would suppose, that the attraction itself is known accurately, and the theory is on a firm basis. It becomes however simply apparent, that of this immense, inscrutable and incomprehensible power of nature and particularly of its being and action, we do not, nor can we know anything.

The soul of the laws of attraction is the law of quadrate. The attracting force acts inversely, proportionally to the quadrate of the distance. Thus Newton has decided.

If we ask our learned men, our authorities, our sages,

whence this law is derived, on what fact it depends, what phenomena it rests upon, whether they have observations for it, whether they have not perhaps established its truth by an experiment made with a machine, or whether they have discovered at all one or more phenomena, which prove the correctness of the law, the unanimous answer is: "no, nothing, of the sort, but Newton has discovered the law, and as this inspired mortal has succeeded in entering into the sanctuary of the universe, whither nobody before him had entered, and nobody will ever enter after him, we must consider the law to be a direct manifestation, and abide by it conscientiously, as long as there appears no necessity for setting it aside!" If Newton, instead of the quadrate, had "discovered" as law another potency of entire or broken numbers, the mass of the sun would have had to accommodate itself to it, for his learned successors do not know any means of transposing themselves to the remote space of the universe in order to obtain there a personal conviction of the state of things.

Newton's theory of universal gravitation is at the same time sublime and colossal. What guarantees the stability of the universe, what supports the celestial bodies in space, what leads them in their orbits, is an immense power of nature, it is attraction! Had Newton stopped at this sublime notion, had he remained satisfied with his originally great idea, contented reason would have reposed in the thought, that the universal attraction governs the general and mutual attraction of all celestial bodies, the relative and immutable distances of them, and thus makes possible a likewise general uninterrupted movement. But Newton goes further, his active fancy leads him to the

idea, that the same power, which guarantees the stability and has induced the wonderful order and harmony of the universe, destroys its own work, and may therefore cause disorder, too; the same fancy suggests to him that all variations observed in the motions and positions can only be irregularities, inequalities and perturbations effected by attraction. In consequence of this imagination Newton states his laws, and it may be a matter of course, that he often got into doubts about his own work.

The motions of the celestial bodies being regulated by the system, ensured by the laws, it was not necessary to apply one's self to study the movement; if, however, one wishes to give an account of the causes of the disorders, which, of course, are not produced by the movement, one must look for them elsewhere, but where to look for them, one did not know.

IX.

The elements of the elliptical orbits: the half great axis and the time of revolution depending on it; the eccentricity of the closed orbit; the longitude of the perihelion, the longitude of the ascending knot, and the inclination of the orbit to the ecliptic, don't exist at all in reality in the sense adopted by theory.

If an astronomer of our time says: "The elements of the elliptical orbits are derived from observations of more than 3000 years; it is from them, that the planetary tables as well as the yearly ephemerides are calculated; the results of the calculations agree with the observations and the positions of the celestial bodies (the solar system) are for each supposed moment nearly precisely such as proceed from the tables, the consequence of which is therefore the correctness of the supposed elements," he may be sure that it will not occur to the thoughts of anybody to object to it. If, however, this astronomer adds: "It is from the correctness of the elements and the results of calculation that there arises the proof that the system of Copernicus and the laws of Kepler are a fact," he has said something thoroughly false and contradictory to the general movement. Copernicus and Kepler had a fixed sun, but this has since that time got into motion.

It is pretended: "Astronomers don't meddle with the absolute movement of the celestial bodies in space." If

they did abide consistently by this sentence, what we should read in their books, would be very nearly as follows:

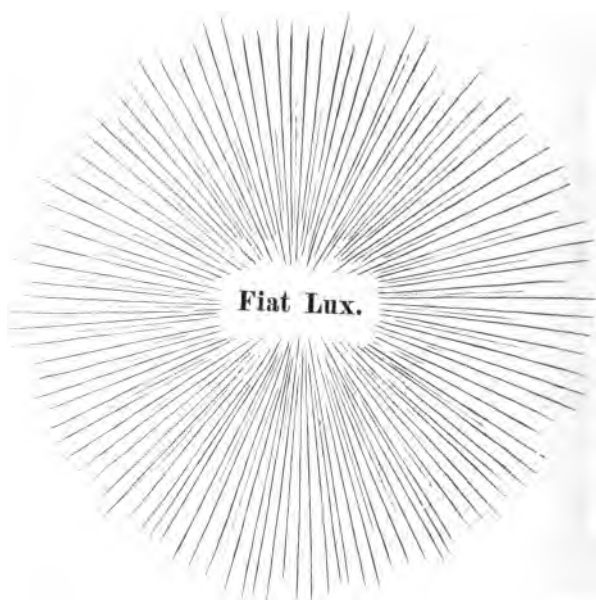
“What we can, and especially do, observe, are the positions and motions of the celestial bodies; both are projected on the celestial sphere, on the apparent heavenly hollow sphere, in the centre of which is our eye; we see them from the earth, which moves, too, from our point of observation on the surface of the earth. The movement of a planet projects itself on the apparent heavenly hollow sphere in such a manner as if it were circulating in an ellipse, the half great axis, eccentricity and inclination to the ecliptic of which are such and such; as we know the apparent situation of the vernal point and the inclination of the ecliptic to the equator, we have the epoch, longitude and ascending knot of the planet. As this position of the movement repeats itself periodically and is always the same, it is evident, that, in order to determine the situation of the planet with reference to the starry heaven and the sun, we can only calculate with such elements as give the observable position for a result. Now, if the ellipses with their appertenances like the ecliptic are no reality and mere products of the imagination, this is indifferent to the calculation, for it must bring forward the apparent and does not care either for the reality or for the name, by which one denotes the observed phenomena. That the orbits are close, is a supposition, which might arise from a superficial, inattentive observation of the phenomena of movement; that observations have been made, and still are made under the preconceived opinion that the planets are forced to move according to the system of Copernicus and the laws of Kepler, is a prejudice from the influence of which the observer can hardly escape. It is, however, not only by

the solar movement, that the closed orbits have been abolished, but it has been proved by the observations themselves, that the orbits don't close. As to the orbit of the earth especially, it appears clearly that the end-point of its curve of revolution after an accomplished period does not project itself on the same place of the celestial sphere, but on a point which is situated 50" 3 more to the east, which is indicated, too, distinctly by the yearly movement of the sun. If, in spite of all these facts, theory continues to announce ellipses and closed orbits as an indisputable truth, there is to be found in this the proof of its labouring under a chronical, incurable sickness.

We believe ourselves bound to inform the reading and thinking public, that the astronomers and mathematicians of our time have agreed together to pass over with condescending silence all those endeavours of learned and unlearned men which tend to demonstrate the untenableness of the Copernican conception of the world. It is in the interest of the science that we protest against this proceeding, for science suffers from it, and is even insulted. Some of the most famous astronomers are feeling the impulse to compose popular works to inform the public; it is the duty of those in the first rank to bring clearness into the proposed question. The most noted in this respect of present astronomers are Newcomb at Washington and Weiss at Vienna, the editor of a new edition (the 7th) of Littrow's "Wonders of Heaven."

As long as the question relating to the sun being considered as "at rest" is not cleared up, modern astronomical theory must be looked on as a product of the imagination, and has no greater value than the

conception of the world of Ptolemaeus and Tycho, for there is no fixed or immoveable thing in the universe, neither a fixed earth, nor a fixed sun, nor a fixed star. All is moving. Each celestial body has a triple movement: a rotation round its axis, its own motion, and it must follow the chief member of its group (system).



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